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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/676,411	09/30/2003	Robert Bristol	42P16691	8060
8791 7590 12/31/2007 BLAKELY SOKOLOFF TAYLOR & ZAFMAN 1279 OAKMEAD PARKWAY SUNNYVALE, CA 94085-4040			EXAMINER CHACKO DAVIS, DABORAH	
			ART UNIT 1795	PAPER NUMBER
			MAIL DATE 12/31/2007	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/676,411	Applicant(s) BRISTOL ET AL.	
	Examiner Daborah Chacko-Davis	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 October 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-27 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>11/07</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-3, 7-11, 15-19, and 23-24, are rejected under 35 U.S.C. 102(b) as being anticipated by U. S. Patent No. 5,565,304 (Honda).

Honda, in col 3, lines 40-59, in col 4, lines 28-30, in col 5, lines 34-46, in col 8, lines 10-20, and lines 45-52, discloses a method of forming a pattern in a semiconductor device including forming a resist layer on a device layer (etch-resistant layer), said resist layer includes a baseline material such as polyhydroxystyrene, highly absorbing material such as antimony, thinning the resist material coating to a desired thickness, and improving the efficiency of the PAG in the resist to capture the secondary electrons produced in the resist (when exposed to X-ray, the radiation generates secondary electrons in the resist, resulting in the interaction of the PAG to produce a halogen acid (PAG in the resist is triphenyl sulfonium tetrafluoroborate) that catalyses the crosslinking reactions, thereby increasing the efficiency of the PAG, and controlling the moieties generated due to irradiation (proximal to the PAG), pattern transferring the resist pattern formed to define areas of the device (claims 1-2, 7, 9-10, 15, 17-18, and 23). Honda, in col 5, lines 40-46, and in col 6, lines 53-55, discloses that the antimony

is added in the claimed amount (5% to 30%) in the resist composition (claims 3, 11, and 19). Honda, in col 8, lines 53-55, discloses that the resist layer is exposed to X-ray irradiation (claims 8, 16, and 24).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 4, 12, and 20, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 5,565,304 (Honda) in view of U. S. Patent No. 6,753,129 (Livesay et al., hereinafter referred to as Livesay).

Honda is discussed in paragraph no. 5.

The difference between the claims and Honda is that Honda does not disclose the highly absorbing materials (claimed polymers) recited in claims 4, 12, and 20.

Livesay, in col 8, lines 45-58, discloses that the resist composition includes a fluoropolymer.

Therefore, it would be obvious to a skilled artisan to modify Honda by employing the absorbing material suggested by Livesay because Livesay, in col 5, lines 55-61, in col 7, lines 60-67, and in col 8, lines 20-57, discloses that adding fluoro polymers in resist compositions enables the formation of a uniform film on the substrate, and increases the surface hardness and dry etch resistance of the resist pattern.

5. Claims 5, 13, and 21, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 5,565,304 (Honda) in view of U. S. Patent No. 7,049,044 (Gonsalves et al., hereinafter referred to as Gonsalves).

Honda is discussed in paragraph no. 5.

The difference between the claims and Honda is that Honda does not disclose that the resist layer is thinned to a thickness below 100nm (claims 5, 13, and 21).

Gonsalves, in col 14, lines 25-34, discloses forming a thin layer of resist with a thickness less than 100nm.

Therefore, it would be obvious to a skilled artisan to modify Honda by employing the thickness range suggested by Gonsalves because Honda, in col 8, lines 10-21, discloses thinning the resist layer to a desired thickness and Gonsalves, in col 2, lines 1-25, teaches using the resist layer compositions to form sub-100nm patterning in order to be applicable for next generation lithography.

6. Claims 6, 14, and 22, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 5,565,304 (Honda) in view of U. S. Patent No. 5,034,304 (Feely).

Honda is discussed in paragraph no. 5.

The difference between the claims and Honda is that Honda does not disclose increasing the PAG (photoacid generator) concentration in the resist (claims 6, 14, and 22).

Feely, in col 6, lines 15-35, discloses increasing the PAG concentration in the

resist composition.

Therefore, it would be obvious to a skilled artisan to modify Honda by increasing the concentration of the PAG in the resist as suggested by Feely because Feely, in col 6, lines 15-35, discloses using higher concentrations of PAG in the resist enables the resist to be imageable in X-ray wavelengths, and enables the formation of a much higher image resolution.

7. Claims 25-27, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 5,565,304 (Honda) in view of U. S. Patent Application Publication No. 2003/0003393 (Yamaguchi et al., hereinafter referred to as Yamaguchi).

Honda is discussed in paragraph no. 2.

The difference between the claims and Honda is that Honda does not disclose that the thickness is balanced with dosage of radiation exposure to have an overall transmission of approximately 50% (claims 25-27).

Yamaguchi, in [0071], [0072], [0074], discloses that the thickness of the photoresist film and the amount of light used for exposure is adjusted so as to obtain an absorption coefficient of about ≤ 7 which is approximately 50% transmittance.

Therefore, it would be obvious to a skilled artisan to modify Honda by employing the method of adjusting the photoresist or imaging layer thickness in order to achieve the desired transmittance as suggested by Yamaguchi because Yamaguchi, in [0035], discloses that employing a smaller layer thickness in the photoresist layer increase the

light utilization efficiency and improves the pattern rectangularity by reducing the reflection from the substrate.

Response to Arguments

8. Applicant's arguments filed November 5, 2007, have been fully considered but they are not persuasive (See arguments and responses addressed below). The 102 and 103 rejections made in the previous office action (paper no. 20070820) are maintained.

A) Applicants argue that Honda does not disclose improving efficiency of the PAG to capture secondary electrons.

Honda, in col 8, lines 46-51, discloses that the resist can be exposed to radiations such as X-rays, and when exposed to X-rays the radiation generates secondary electrons in the resist, resulting in the interaction of the PAG to produce a halogen acid (PAG in the resist is triphenyl sulfonium tetrafluoroborate) that catalyses the crosslinking reactions, thereby increasing the efficiency of the PAG.

B) Applicants argue that neither Honda nor Livesay, nor Gonsalves nor Feely, nor Yamaguchi teaches a baseline material added by a highly absorbing material selected from the group recited in claims 1, 3, 9, 11, 17, and 19.

Honda, in col 4, lines 28-47, teaches a photoresist composition that includes a baseline material such as polyhydroxystyrene. Honda in col 5, lines 40-67, and in col 6, lines 52-55, discloses that the PAG's (photoacid generators, a component of the photoresist composition) includes onium salts, and that the highly absorbing onium salts (material) of antimony (e.g.: hexafluoroantimonate etc.) are added in the claims

percentage (about 5% to 30%) along with the baseline material to form the resist material composition i.e., the highly absorbing salt comprising antimony. Therefore, Honda does teach the claimed resist material composition.

C) Applicants argue that Honda does not teach thinning of the resist.

The claims recite "thinning the resist to a predetermined thickness". Honda, in col 8, lines 10-19, discloses that the resist composition can be applied by dipping, spraying, whirling, and spin coating, and that the speed and amount (type of spinning equipment) and time utilized is adjusted to obtain a desired thickness i.e., a predetermined thickness. Honda does not teach a puddle of resist on the substrate surface; Honda teaches a resist solution applied uniformly i.e., it is thinned to a desired uniform thickness. Additionally, the claim does not recite a thinner being applied, nor does it recite a specific thickness that an original uniform thickness of the resist layer has been reduced to. Gonsalves is relied upon to disclose thinning the resist to a thickness less than 100nm. Also, Honda teaches different spinning techniques in order to obtain a resist film of desired thickness.

D) Applicants argue that Honda and Livesay do not disclose the claimed percentage of the materials recited in claims 4, 12, and 20.

Honda discloses highly absorbing material in the claimed percentage (see column 6, lines 53-55) about 5% to 30%. An about 30 wt% of the highly absorbing material is about 10 % by volume of the claimed material. Livesay is not depended upon to disclose the percentage of the highly absorbing material. Livesay is depended

upon to disclose the use of the claimed highly absorbing material such as fluoropolymer in the resist composition. See paragraph no. 7.

E) Applicants argue that none of the cited materials disclose the cited materials (claimed highly absorbing material) in the percentage ranging from 10% to 20%.

See paragraphs A), and C). Additionally, Honda is relied upon to disclose the use of highly absorbing materials in the claimed percentage (i.e., from about 5% to 30%).

F) Applicants argue Honda and Feely do not disclose increasing a PAG concentration in the resist.

Honda is not relied upon to teach increasing PAG concentration. Feely teaches that increasing the PAG concentration in the resist composition (see column 6, lines 15-50).

G) Applicants argue that Honda does not disclose an etch resistant layer below an imaging layer.

Honda, in col 8, lines 22-45, teaches forming a resist layer i.e., an imaging layer on a device layer i.e., the device layer is the etch resistant layer, the device layers suggested by Honda include etch resistant layer such as silicon oxide.

Conclusion

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daborah Chacko-Davis whose telephone number is (571) 272-1380. The examiner can normally be reached on M-F 9:30 - 6:00. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

dcd


December 26, 2007.


John A. McPherson
Primary Examiner
Art Unit 1795